

SECTION C — ( $3 \times 10 = 30$  marks)

Answer any THREE questions.

16. Fit a parabola by method of least square to the following data also estimate  $y$  at  $x = 6$ .

$x$ :	1	2	3	4	5
$y$ :	5	12	26	60	97

17. Find the positive root of  $f(x) = 2x^3 - 3x - 6$  by Newton Raphson method correct to 5 decimal places.

18. Solve by triangularization method the following systems.

$$x + 5y + z = 14; 2x + y + 3z = 13; 3x + y + 4z = 17$$

19. From the following table of half yearly premium for polices maturing at different ages estimate the premium for polices maturing at age 46 and 63.

Age $x$ :	45	50	55	60	65
Premium $y$ :	114.84	96.16	83.32	74.48	68.48

20. From the following table estimate  $e^{0.644}$  correct to 4 decimal places using Stirling's formula.

$x$	0.61	0.62	0.63	0.64	0.65	0.66	0.67
$e^x$	1.8404	1.8598	1.8776	1.8965	1.9155	1.9348	1.9542

NOVEMBER/DECEMBER 2023

23UEDA12B — NUMERICAL METHODS — I

Time : Three hours

Maximum : 75 marks

SECTION A — ( $10 \times 2 = 20$  marks)

Answer ALL questions.

- Write the error committed when we fit a parabola by the method of least squares.
- Write the equation of straight line passing through the 2 points  $(x_1, y_1)$ ,  $(x_2, y_2)$ .
- If  $g(x)$  is continuous in  $[a, b]$ , then under what condition the iterative method  $x = g(x)$  has a unique solution in  $[a, b]$ .
- State the condition of convergence of Newton's Raphson method.
- For solving a linear system compare the Gauss elimination method and Gauss Jordan method.
- State a sufficient condition for Gauss Jacobi method to converge.
- Find the sixth term of the sequence 8, 12, 19, 29, 42.
- Write the relation between the operators  $\delta$  and  $E$ .



9. Which formula gives a better result if  $\frac{1}{4} < u < \frac{3}{4}$ .

10. Write Gauss forward interpolation formula.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Find a straight line fit of the form  $y = ax + b$  by the method of group averages for the following data :

$x$	0	5	10	15	20	25
$y$	12	15	17	22	24	30

Or

(b) Fit a curve of the form  $y = ab^x$  to the data.

$X$	1	2	3	4	5	6
$Y$	151	100	61	50	20	8

12. (a) Find the Positive root of  $x - \cos x = 0$  by the bi-section method.

Or

(b) Find the positive root of  $xe^x = 2$  by the method of false position.

13. (a) Solve the system of equations by Gauss elimination method.

$$x + 2y + z = 3; \quad 2x + 3y + 3z = 10; \\ 3x - y + 2z = 13.$$

Or

(b) Solve the following system of equations by using Gauss-Seidal method correct to 2 decimal places.

$$8x - 3y + 2z = 20; \quad 4x + 11y - z = 33; \\ 6x + 3y + 12z = 35.$$

14. (a) Express  $x^4 + 3x^3 - 5x^2 + 6x - 7$  in factorial polynomial and get their successive forward differences taking  $h = 1$ .

Or

(b) Find  $y_6$  if  $y_0 = 9$ ;  $y_1 = 18$ ;  $y_2 = 20$ ;  $y_3 = 24$  given that 3<sup>rd</sup> differences are constant.

15. (a) Using Gauss backward interpolation formula find the population for the year 1936 given that

Year $x$	1901	1911	1921	1931	1941	1951
Population in thousand $y$	12	15	20	27	39	52

Or

(b) Given the following table find  $y(35)$  using Bessel's formula :

$x$ :	20	30	40	50
$y$ :	512	439	346	243